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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
LAURITZEN, AMANDA L	
ART UNIT	PAPER NUMBER
3737	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/797,377	MA ET AL.	
	Examiner	Art Unit	
	Amanda L. Lauritzen	3737	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 April 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5,7-14 and 16-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *3* is/are allowed.

6)☒ Claim(s) *1,2,4,5,8-14 and 16-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _____ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

This action is in response to the submission after final filed 16 April 2007. The amendment to claim 5 to overcome rejection under 35 U.S.C. 112, second paragraph has been entered.

Response to Arguments

Applicant's arguments directed to reconsideration of claim 3 are persuasive and as such rejection of claim 3 has been withdrawn. The prior art does not teach or suggest a method for measuring a volume flow parameter from an annular configuration of elements of a transducer array and performing two-dimensional imaging with the transducer array by operating the transducer array as a 1.5D array. Finality of the previous rejection has been withdrawn. This action presents Brisken (US 4,530,363) as applicable to claims pending in the application, as discussed with Mr. Anand Sethuraman in a telephone conversation on 28 June 2007.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 1, 4, 5, 7-11, 13, 14 and 16-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Brisken (US 4,530,363), or alternatively, under 103(a) as being unpatentable over Brisken.

Brisken discloses a method and associated transducer array for both measuring a volume flow parameter and imaging with ultrasound, including measuring a volume flow parameter as a function of acoustic energy transmitted from an annular configuration of elements and

performing two-dimensional imaging, wherein the transducer array comprises at least three rows of elements, the three rows being straight along an azimuth dimension and having rectangular elements (Figs. 5-8), further comprising using a first group of elements from at least one of the at least three rows of elements as a ring annular element and a second group of elements as a center annular element for measuring a volume flow parameter, and using at least one of the at least three rows of elements for two-dimensional imaging (refer to the Abstract, which specifies selective activation of elements as a linear array for sector scanning and selective activation of concentric annular elements for focused Doppler flow measurements; also Fig. 6 in which individual row(s) of the array are energized for anatomical scanning understood as one of a B-mode and Doppler mode image, described at col. 3, lines 40-61 which leads to positioning the transducer array relative to a vessel based on the localized vessel and switching for near-field Doppler operation of elements with a central annular group designated [1] and a surrounding annular element group designated [2] in Fig. 7; further described at col. 3, line 62 – col. 4, line 8). The uniform sensitivity technique is described at col. 2, line 48 – col. 3, line 4.

Regarding claim 7, different transmit waveform polarity and apodization is provided to different groups of elements in the measure of a volume flow parameter as described at col. 4, lines 23-29, with groups of elements corresponding to those sharing the same designation from 1-12 in Fig. 8. Anatomical scanning is accomplished with focus as a function of apodization and delay along at least one row of elements at col. 3, lines 43-50, with a delay between elements 1-9 in Fig. 6.

Regarding claim 8, measure of a volume flow parameter and two-dimensional imaging are performed with the transducer array of Figs. 5-8. Concentrating now of Fig. 5, three rows of

elements are shown to extend along the azimuth dimension a first length (three rows containing elements [18-26], [27-35] and [36-44]). Kerfs exist between individual elements and the third row (here, designated by elements 18-26) includes at least one kerf extending along the azimuth dimension less than the first length (this kerf that is less than the first length exists between element rows [18-26] and [11-17].

Regarding claim 9, the system of Brisken includes a processor to execute calculation(s), a display and a transducer having a plurality of elements in an N x M grid with at least four rows of elements, with a two-dimensional anatomical image responsive to at least one of the rows.

Regarding claim 10, selective activation of elements for annular operation and linear operation requires associated array interconnections.

Regarding claims 14 and 16, the annular configuration of elements is operable to uniformly insonify a vessel with an aperture of similar azimuth and elevation sizes, as per operation according to Fig. 7, which shows a same number of elements extending in both directions and col. 4, lines 1-8 and col. 2, line 48 – col. 3, line 4 for uniform insonification. The elements designated [1] and [2] are disclosed to have differing transmit characteristics, which include apodization, delay and polarity parameters.

Regarding claim 17, turning to Fig. 5, three rows of elements are shown to extend along the azimuth dimension a first length (three rows containing elements [18-26], [27-35] and [36-44]). Kerfs exist between individual elements and the third row (here, designated by elements 18-26) includes at least one kerf extending along the azimuth dimension less than the first length (this kerf that is less than the first length exists between element rows [18-26] and [11-17].

Regarding claims 18-19, turning again to Fig. 5, the transducer comprises first and second rows of elements [18-26] and [11-17] with a kerf extending less than the full azimuth length of the transducer array and third and fourth rows of elements extending from the first row, second row and kerf from each azimuth side, the elements having an elevation width substantially equal to the width of the first and second rows and kerf together.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 2 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brisken, as applied to claims 1 and 9 above, in view of Nudell et al. (US 5,085,220). Brisken teaches all features of the invention substantially as claimed, including the method of flow calculation based upon the power associated with two beams using the ACVF uniform sensitivity technique, but is not particular to the details of a first velocity measure in the calculation of the volume flow parameter; however, in the same field of endeavor, Nudell discloses the method for calculation of a volume flow parameter (i.e. cardiac output) that also includes transmission of two Doppler paths to obtain a first velocity and power associated with the first (i.e. wide beam) Doppler path and a second power associated with the second (i.e. narrow beam) Doppler path (col. 2, lines 37-44). It would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated the volume flow parameter method of calculation as taught by Nudell with the

imaging system and volume flow measure method of Brisken to provide improved accuracy in measure of a volume flow parameter.

3. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Brisken as applied to claim 9, further in view of Buck et al. (US 6,544,181).

Brisken discloses all features of the invention as substantially claimed, as detailed above, but does not teach operation as a 1.5D array; however, Buck et al teach use of a 1.5D array in a system with capacity for measure of a volume flow parameter and two-dimensional imaging (col. 23, lines 15-28; also Figs. 2A-C for image and Doppler modes). It would have been obvious to one of ordinary skill in the art to comprise a 1.5-dimensional transducer array in the interest of cost-savings over a two-dimensional array while still providing capability of flow measure with two-dimensional imaging (Buck et al, col. 23, lines 15-18).

4. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Brisken as applied to claim 9 above, in view of Fu et al. (US 4,431,936).

Brisken discloses all features of the invention as substantially claimed, including providing differing transmission parameters to elements in the annular configuration (col. 4, lines 1-8 as applicable to Fig. 7 in which annular element groups designated [1] and [2] are disclosed to have differing transmit characteristics and apodization), but is not specific to details of providing waveforms of opposite polarity; however, Fu et al disclose providing different transmit waveform polarity in the form of a field direction parameter applied to annular elements (col. 4, lines 63-64). It would have been obvious to provide means for control of waveform polarity of annular elements as taught by Fu et al, for the purpose of controlling added parameters ultimately for generation of the desired uniform beam pattern (Fu, col. 5, lines 48-66).

5. Claims 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brisken, as applied above, further in view of Robinson et al. (US 6,419,633).

Brisken discloses a multiple element, multiple row transducer having a kerf between row(s) extending less than the first length and less than the full azimuth length, but does not provide the detail of the elemental configurations specifying an elevation width; however, Robinson teaches a 19-row (azimuth direction), 19-column (elevation direction) "sparse" array capable of providing both B-mode and Doppler two-dimensional imaging, in which there are inactive spaces between the active transducer elements (col. 3, lines 10-12; also col. 9, lines 28-29) with switches and coax cables that establish a connection to activate elements (col. 4, lines 48-50); therefore, any configuration of rows and/or elements can be established with this array, as long as it is within the 19-row, 19-column dimensions, so additional elements that extend from each azimuth side can be configured to have an elevation width that is substantially equal to the elevation width of the first row, second row, and kerf together, as in claim 19, or the width of the additional elements could be configured as greater than the width of the elements of each of the first through fifth rows, as in claim 20. The structural configurations of transducer arrays cited in claims 19 and 20 are possible with the sparse transducer array of Robinson, and therefore these configurations and others accommodated by the sparse transducer array would have been known to those of ordinary skill in the art at the time of the applicant's invention and therefore obvious to be used with the system of Brisken for the purpose of improving image quality by increasing the number of array elements and/or rows. Further, since there is no criticality for the named arrangements and elevational width configurations presented in Applicant's disclosure,

and/or because the arrangements are satisfied by switching elements with the array of Robinson, the configuration(s) are considered an obvious matter of design choice within the skill of the art.

Allowable Subject Matter

The following is a statement of reasons for the indication of allowable subject matter:

1. The limitation of claim 3, specifically, measuring a volume flow parameter from an annular configuration of elements of a transducer array and performing two-dimensional imaging by operating the same transducer array as a 1.5D array, is neither disclosed nor suggested in the prior art. Claim 3 is allowable.

2. Regarding claim 12, since it is not clearly claimed that the same array containing an annular configuration of elements that is used for measure of a volume flow parameter is being operated as a 1.5-D array for two-dimensional imaging (as in claim 3), the subject matter of claim 12 is not allowable (nor objected to as depending from a rejected base claim). Therefore if rewritten in independent form to merely include all limitations of claims 9 and 12, it would not be allowable unless it were further revised to clearly specify this feature.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Amanda L. Lauritzen whose telephone number is (571) 272-4303. The examiner can normally be reached on Monday - Friday, 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian L. Casler can be reached on (571) 272-4956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

ALL
6/28/2007

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